Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies	)	ET Docket No. 92-9 RM-7981 RM-8004

REPLY COMMENTS OF THE
FIXED POINT-TO-POINT COMMUNICATIONS SECTION
OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

The Telecommunications Industry Association ("TIA") is a membership organization representing over 500 manufacturers of equipment used by all sectors of the communications industry. The TIA Fixed Point to Point Communications Section is the major industry group representing fixed point to point microwave manufacturers. The TIA Fixed Point to Point Communications Section* is pleased to submit these reply comments on behalf of its membership in the above-captioned Further Notice of Proposed Rulemaking.

Respectfully submitted,

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January 27, 1993

* Alcatel Network Systems does not concur with the consensus expressed in these Comments.

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SUMMARY

The rules adopted to govern use of the frequency bands designated to house displaced 2 GHz users must facilitate the most efficient use of the spectrum, maximize spectrum utilization, minimize interference, and provide sufficient wideband and narrowband channels for displaced 2 GHz users. Rules that meet these standards will achieve the Commission's overarching goal of increasing competition in services, new technologies, and equipment.

After reviewing the comments filed in this docket, TIA remains convinced that a 1.25 MHz-based channelization plan is best suited to meet the various user needs and the public interest. In contrast to a number of alternative channelization proposals offered in the comments, TIA's 1.25 MHz-based channelization proposal advances the Commission's public interest goal in promoting competition, spectrum efficiency and maximum spectrum utilization. TIA's proposed plan does not create inefficient spectrum "remnants" while fairly accommodating the narrowband and wideband channel requirements of 2 GHz relocating users in the 4, 6, 10, and 11 GHz frequency bands. In response to the position of several commenters and upon further consultation with Comsearch and other parties, TIA modifies its channelization proposal for the 6 GHz band and urges the Commission to retain the current 29.652 MHz spacing in the 6 GHz band. (A modified channelization plan for the 6 GHz band is attached as "Appendix A".)

In these reply comments, TIA also reaffirms its view that the Commission should adopt technical Part 21 coordination procedures for all shared bands, identical

interference standards for private and common carriers, phased-in efficiency standards for digital microwave equipment, and rules providing for Commission administration of "growth" channels. Further, in light of the Commission's stated objective to adopt technical rules for the bands above 3 GHz to clear spectrum for the introduction of emerging technologies in the 2 GHz band, TIA urges the Commission to refrain from adopting grandfathering rules that would permit incumbent 10 GHz licensees to expand their Digital Termination Service systems. The TIA also urges the Commission to accelerate its negotiation with NTIA concerning non-government access to government spectrum -- particularly the 3.6-3.7 GHz band -- to provide much-needed spectrum for displaced 2 GHz users.

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The Telecommunications Industry Association's Fixed Point-to-Point Communications Section ("TIA") hereby submits its reply comments in the above-captioned proceeding. Many parties submitting initial comments shared the TIA's view that the channelization plan and technical rules adopted in this proceeding must be carefully designed to make the most efficient use possible of the spectrum, avoid interference, promote competition in the equipment market, and adequately accommodate the narrowband and wideband needs of the 2 GHz users being displaced to higher frequencies to make room for new emerging technologies. As stated in the TIA's opening comments, the Commission can best meet these and its other public interest goals by adopting the TIA's proposed channelization plan, as modified herein, and the specific revisions to the technical rules set forth by the TIA in its initial comments.[1/]

[1/] In the initial comments, the TIA submitted a detailed channelization plan for the 4, 6, 10 and 11 GHz bands.

INTRODUCTION

As the principal U.S. industry association representing equipment manufacturers serving the 2 GHz fixed point-to-point microwave market, the TIA's primary concerns in this proceeding are to ensure that the Commission's rules adopted for the higher "relocation" frequencies reasonably accommodate displaced 2 GHz users, do not impair competition in the microwave equipment market, waste valuable spectrum or unnecessarily increase user costs. In light of these critical concerns, in the initial comments, the TIA urged the Commission to adopt certain modest but important revisions to the channelization plan for the 4, 6, 10, and 11 GHz bands and other technical rules proposed in the Further Notice of Propose Rulemaking[2/] ("Notice"). TIA's proposed plan is designed to fairly address the needs of all interested parties while promoting the Commission's overarching goal of increasing competition in services, new technologies and equipment. Having reviewed the opening comments in this proceeding, the TIA believes that the channelization plan -- with the addition of one modification -- and technical rules proposed in the TIA's comments best meet the Commission's public interest objectives and the practical needs of the new and incumbent users of the higher frequency bands and equipment industries.

[2/] Redevelopment of the Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, Further Notice of Proposed Rulemaking, ET Docket No. 92-9, FCC 92-357 (released September 4, 1992). The Commission extended the reply comment period in this proceeding to January 27, 1993.

The TIA continues to believe that the Commission should adopt the specific rule modifications that it proposed in its comments.[3/] In the comments, many parties expressed views similar to the TIA's position on a number of issues.[4/] In these reply comments, the TIA responds to other parties who propose different plans and rules and

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[3/] As detailed in the Comments, TIA specifically proposes that the Commission (1) modify the channel plan to incorporate 1.25 MHz channels (rather than 1.6 MHz channels) and eliminate the proposed 400 and 800 kHz channels; (2) modify the narrowband and wideband channels in the lower 6 GHz band; (3) make high capacity allocations available in the 4 GHz band by increasing maximum bandwidths to 40 MHz; (4) make available a range of wideband and narrowband channels in the 11 GHz band; (5) require substantial justification for the assignment of 15 GHz and below wideband channels (i.e., 10 MHz and greater channel bandwidths); (6) phase-in efficiency standards for digital microwave equipment; (7) establish identical interference protection criteria and coordination procedures for both private and common carrier systems; and (8) accelerate negotiations toward final arrangements with NTIA to establish terms for non-government licensee access to the 1.7-1.85 and 3.6-3.7 GHz bands. See Comments of the Telecommunications Industry Association Fixed Point-to-Point Section ("TIA"), filed December 11, 1992.

[4/] For example, many parties agreed that the Commission should expedite discussions with the National Telecommunications Information Administration concerning access of nongovernment users to government spectrum. See Comments of the United States Telephone Association, at 5; Comments of American Personal Communications, at 4-5. Numerous parties also agreed that operations in the shared bands should be subject to the Part 21 prior coordination procedures. See Comments of the National Spectrum Managers Association, at 6; Comments of Comsearch, at 12-17; Comments of the United States Telephone Association, at 5-7; Comments of the Utilities Telecommunications Council, at 9-10. The UTC also argues that given the importance of preserving private microwave interference standards and the convergence of common carrier and private microwave standards, the TIA should be recognized as the appropriate entity to develop consistent interference standards. Comments of the Utilities Telecommunications Council, at 11. TIA recommended in its comments that the Part 94 private microwave standards be applied to operations in the shared bands. Comments of TIA, at 12-13.

modifies slightly its initial proposal. Specifically, as discussed in detail below, TIA believes that:

- A channelization plan based on 1.25-MHz channels would promote competition, spectrum efficiency, and maximum spectrum utilization.
- 29.652 MHz-band spacing in the lower 6 GHz band will serve the public interest. (TIA modifies its 30 MHz proposal accordingly.)
- TIA's rechannelization plan fairly balances the need for both wideband and narrowband users in the 4, 6, 10 and 11 GHz frequency bands.
- The Commission should not create exclusive Digital Termination Service frequencies in the 10 GHz Band or grant licenses for new nodal stations.
- The 3.6-3.7 GHz band should be made available to displaced 2 GHz users.

Given the significant disadvantages of other parties' proposed channelization plans and technical rules and the need to accommodate the diverse requirements of microwave users and manufacturers, the Commission should adopt the TIA's proposals, as modified.

I. A 1.25 MHz-Based Channelization Plan Will Make the Most Efficient Use of Spectrum and the Existing Capabilities of a Majority of Equipment Manufacturers

In the opening comments, the TIA urged the Commission to adopt a channelization plan based on 1.25 MHz channels, rather than the 1.6 MHz-based plan proposed in the Notice.[5/] As detailed in the TIA's initial comments, 1.25 MHz-based channels can be easily "stacked" to accommodate standard larger bandwidth channels without wasting

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[5/] Comments of TIA, at 5-6.

valuable spectrum.[6] Further, a 1.25 MHz-based plan is consistent with the existing channelization in other bands. A channel based on 1.25 MHz-based channels also has the significant advantage of allowing the majority of equipment manufacturers to utilize existing production capabilities thus fostering fair and vigorous competition in equipment supply.

No commenting party raised any argument against a 1.25 MHz-based channel plan; nor did any party submit any compelling reason specifically in favor of a 1.6 MHz-based plan as compared to other options.[7] Accordingly, the Commission should adopt the 1.25 MHz-based channel plan for the 4, 6, 10 and 11 GHz bands.

II. TIA Modifies its Original Proposal to Preserve the 29.652 MHz Channel Separation in the 6 GHz Band

In the opening round of comments, numerous parties objected to the Notice's proposal to adopt 30 MHz spacing in the 6 GHz band because, according to these parties, that change would result in substantial waste of spectrum. Other commenters

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[6] In contrast, narrowband channels in a 1.6 MHz-based plan cannot be easily multiplied into 5, 10, 30 MHz bandwidth channels without creating inefficient spectrum "remnants." See Comments of TIA, at 5.

[7] While most parties did not address this issue, some parties stated that alternative plans would be acceptable provided that the plans met the Commission's overall objectives in this proceeding and adequately address the requirements of the microwave manufacturing industry and user community. See, e.g., Comments of the American Petroleum Institute, at 7; Comments of Motorola, Inc. at 4-5. American Personal Communications expressed support for a channelization proposal that would "meet with the acceptance of the microwave community especially as evidenced through the comments of the Telecommunications Industry Association Point-to-Point Section." Comments of American Personal Communications, at 2.

argued that the change to 30 MHz spacing would increase the potential for interference and create inconsistent channel plans that would make it difficult for grandfathered users and new users to coexist.[9/] Based on the TIA's review of the comments and consultation with Comsearch and other parties concerning this issue, the TIA has concluded that 29.652 MHz channel separation can accommodate 30 MHz authorized bandwidth radios and therefore the Commission should adopt a channelization plan that includes 29.652 MHz spacing in the 6 GHz band. Attached hereto is TIA's modified channel plan for the 6 GHz band that incorporates this revision. As reflected in the attached modified plan, this approach can be applied throughout the channelization plan as follows:

Authorized Bandwidth (MHz)	Channel Bandwidth (MHz)
30	29.6520
15	14.8260
10	9.8840
5	4.9420
3.75	3.7065
2.50	2.4710
1.25	1.2355

Although the TIA supports the 29.652 MHz spacing, its proposes that the 30 MHz and 10 MHz authorized bandwidth plans be retained in order to facilitate the implementation of synchronous optical networks ("SONET") interface for STS3 and STS1. In adopting this modification, TIA notes that the 135 Mbps digital radios available today

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[9/] See, e.g., Comments of The Bell Atlantic Companies, at 3; Comments of EMI Communications Corporation, at 4-5; Comments of MRC Telecommunications, Inc., at 3-5; Comments of the United States Telephone Association, at 3-4.

occupy 30 MHz and yet are coordinated into 29.652 MHz channels. This approach will meet the needs of both those who rely on the 29.652 MHz separation and those who use radio equipment that occupies a 30 MHz authorized bandwidth.

III. TIA's Channelization Plan Fairly Balances the Need for Narrowband and Wideband Options in the 4, 6, 10 and 11 GHz Band

The TIA submitted a detailed channelization plan with its initial comments that satisfies the need to ensure that all of the higher frequency relocation bands can accommodate a broad range of displaced narrowband and wideband 2 GHz users. Consistent with the TIA's position, many commenters, including the Utilities Telecommunications Council, Motorola, and EMI Communications, expressed support for a channelization plan that would make available a sufficient number wideband and narrowband channels to support the systems of relocating 2 GHz users.[9] TIA anticipates that a substantial number of 2 GHz users will seek to relocate to the 6 GHz and 11 GHz band to take advantage of certain economic and technical benefits. Given the expected demand, it is critical that the Commission ensure maximum utilization of these bands by making a broad range of narrowband and wideband channels available in the 6 and 11 GHz bands. While there was some disagreement in the opening comments over the precise number of wideband and narrowband channels that should be established in each

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[9] See Comments of EMI Communications Corporation, at 5; Comments of Motorola, at 4-5; Comments of the Utilities Telecommunications Council, at 4-5.

band, the TIA believes that its proposed plan best meets the Commission's goals and addresses the concerns of interested parties.

No commenting party has submitted any sound technical or other reason that would justify adopting a different plan that would accommodate both narrowband and wideband users. TIA's proposal permits many parties with diverse spectrum needs to use the available frequencies without wasting spectrum. TIA has carefully crafted a plan that strikes a reasonable balance between the competing needs of wideband and narrowband channels by making narrowband channels in the lower 6 GHz band available to accommodate long haul microwave systems. In light of the need to preserve 30 MHz channels in the lower 6 GHz band, however, the TIA's proposal also requires that narrowband channels in the upper 6 GHz band be used before users may resort to frequencies in the lower 6 GHz band.[10/] (Consistent with EMI Communication's position, the TIA also generally supports requiring applicants to look first to existing narrowband channels for narrowband use and to demonstrate in their applications a genuine need to use wideband channels.)

[10/] See Comments of United States Telephone Association, at 4. In the interest of maximum spectrum utilization, the TIA also supports a prohibition on channel concatenations, unless an adequate showing of necessity is made, in order to limit the creation of splinter channels. This prohibition will minimize the adverse impact of the new channel plan adopted in this proceeding on existing licensees while maximizing the number of potential users.

Pacific Telesis, for example, argues that spectrum would be wasted if 10 MHz channels were allowed to overlay broadband 30 MHz channels in the 6 GHz band.[11/] Spectrum would not be wasted under TIA's approach, however, since narrowband channels in the upper 6 GHz band will be used before narrowband channels in the lower 6 GHz band. Further, a 10 MHz channel does not necessarily waste spectrum in a 30 MHz channel (although the channel will not be available for a 30 MHz user) because the channel can accommodate two other users on the remaining 10 GHz channels.[12/] In the licensing process, the Commission should ensure that a 30 MHz channel, if divided for use by several licensees, will be able to accommodate three 10 MHz users.[13/] In addition, spectrum efficiency will not be sacrificed under the TIA's plan because 10 MHz radios and 30 MHz radios are subject to the same bit per Hertz efficiency requirements.

MCI proposes a plan that includes twelve 40 MHz bandwidth channels in the 11 GHz band and adds six 40 MHz bandwidth channels in the 4 GHz band. MCI's proposal expressly reduces the frequency alternatives for narrowband channels. In fact, under

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[11/] Comments of Pacific Telesis, at 3-5. The TIA also opposes Pacific Telesis' view that the Commission should "protect" the historical practice of common carriers of securing "growth" channels through the prior coordination process. While the TIA supports implementing a prior coordination process for all fixed microwave operations in the shared bands, it believes that the Commission should retain authority to administer the licensing of microwave channels including "growth" channels. See Comments of TIA, at 13.

[12/] Further, the existing Part 21 rules already permit the subdivision of 30 MHz channels thorough the 1/N rule. See 47 C.F.R. § 21.122 (a)(3). Many cellular operators, including Pacific Telesis are currently using these radios in their networks.

[13/] That is, the Commission should prevent a 10 MHz user from randomly placing a 10 MHz radio within a 30 MHz slot in such a way as to preclude other 10 MHz users from using the two remaining 10 MHz channels in the 30 MHz block.

MCI's approach, less spectrum would be available for narrowband radios at the 4 GHz and 6 GHz bands than is currently available at 2 GHz. MCI proposes to limit narrowband use because it believes that "it is unlikely that equipment manufacturers will develop products adaptable to the numerous frequency choices listed in the Further Notice. . . [and therefore] these extensive allocations will only serve to disrupt wideband system growth."[14/] The TIA's manufacturer members, however, anticipate continued development of a broad array of narrowband and wideband equipment for microwave use. TIA members at this time do not plan to abandon narrowband product manufacturing as a result of the Notice and will continue to meet their customers' needs however they may be affected by the new rules established in this proceeding. Accordingly, the channelization plan adopted in this proceeding should address the expected continued use and development of both narrowband and wideband equipment.

AT&T proposes a channel plan that does not channelize spectrum in the 6 GHz guard bands or certain portions of the 11 GHz band (11185-11215 MHz).[15/] According to AT&T, the 6 GHz guardbands should be reserved for emerging technologies such as personal communications services. The Commission should reject AT&T's proposal. Contrary to AT&T's comments, whether additional spectrum should be reallocated for use by emerging technologies is not at issue in this proceeding. The Commission has already determined that the 2 GHz frequencies will be devoted to emerging technologies and that

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[14/] Comments of MCI Telecommunications Corporation, at 5.

[15/] Comments of AT&T, at 4-5 and Appendix B.

the 4, 6, 10 and 11 GHz band should serve as relocation bands. This proceeding is concerned with the issues identified in the Notice -- namely, how should the spectrum be divided and what technical rules should apply to best accommodate existing and new spectrum users. To that end, the TIA has proposed a plan which includes channelization of the 6 GHz guard bands and fairly accommodate all users.

Moreover, the Commission should be aware that the members of TIA have already developed and commenced distribution of equipment designed for the 6 GHz band in response to the Commission's decision to reallocate the 2 GHz band to emerging technologies. Thus, as a practical matter, if the Commission now were to target the 6 GHz band for an emerging technologies spectrum reserve, fixed microwave equipment manufacturers would be dealt a second significant blow which would lead to serious adverse economic consequences, impair competition in the equipment market, and harm displaced users.

Northern Telecom proposes that only wideband channels should be permitted in the 6 GHz band because, in its view, a mixed wideband and narrowband channel plan would be more difficult to coordinate and will retard the development or expansion of wideband systems.[16/] Northern Telecom offers no compelling technical or other reason why both narrowband and wideband users cannot be accommodated in the 6 GHz band. The TIA's approach recognizes that both wideband and narrowband channels can and

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[16/] Comments of Northern Telecom Corporation, at 4-6. As an alternative, Northern Telecom argues that mixed wideband and narrowband use should occur in the 10.7-11.7 GHz band where two 40 MHz channel pairs should be shared with narrowband applications soughing that 10, 5, 3.75, 2.5 and 1.25 MHz channels. Id. at 5.

should be made available in a spectrum efficient manner in order to meet the requirements of all displaced 2 GHz users.

V. The Commission Should Not Create Exclusive Digital Termination Service Frequencies in the 10 GHz Band or Adopt 10 GHz Grandfathering Rules that Would Permit New Nodal Licenses to Be Granted

TIA opposes SR Telecom's request that the 10 GHz band (or channels 1-4 and 11-14) be reserved exclusively for Digital Termination Service ("DTS") use.[17] The 4 GHz and 6 GHz bands cannot accommodate all displaced 2 GHz users relocated to higher frequencies. In particular, the 10 GHz spectrum is necessary for displaced 2 GHz users with path lengths under 17 kilometers.

One of the Commission's chief objectives in this proceeding is to adopt rules that permit maximum spectrum utilization in order to foster the introduction of new technologies while accommodating existing spectrum users. Given this overriding concern, it would not be appropriate to preclude displaced 2 GHz users from the 10 GHz spectrum when, after 10 years, DTS has failed to develop fully and future demand for DTS radios is, at best, speculative. SR Telecom suggests that reserving the 10 GHz spectrum to DTS may bolster the flagging DTS service by prompting the introduction of DTS radios. First, in the face of competing demands for scarce spectrum, it would not be sound regulatory policy to reserve spectrum based on the mere hope that a valuable service may someday develop. Second, SR Telecom offers no credible arguments or evidence

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[17] Comments of SR Telecom, Inc., at 3-9.

that the "failure" of DTS is attributable to a lack of radio equipment. In fact, DTS radio equipment is currently available at the 18 GHz band. For these reasons, SR Telecom's proposal should be rejected and the 10 GHz frequencies should be made available for use by displaced 2 GHz users.

The TIA also opposes the recommendation of the Bell Atlantic Companies that the Commission adopt "grandfathering" rules for the 10 GHz frequencies which would permit "a [DTS] licensee to add additional nodal stations anywhere within a previously authorized SMSA."[18/] The TIA concurs with the Commission's view that existing systems should be grandfathered and no new installations should be permitted. Point-to-multipoint radio services make extremely inefficient use of the spectrum since such transmissions preclude the reuse of frequencies in the geographic area by other users. The TIA thus believes that the Commission should not continue to grant nodal licenses under a "grandfathering" scheme since this practice would only perpetuate spectrum waste.

VI. Additional Spectrum from the 3.6-3.7 GHz Government Band Should be Made Available to Displaced Users

The TIA agrees with Alcatel's position that, under the Commission's approach in the Notice, it is likely that there will not be sufficient spectrum below 10 GHz to accommodate adequately the requirements of displaced 2 GHz users. TIA therefore

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[18/] Comments of the Bell Atlantic Companies, at 2. See also Comments of the National Spectrum Managers Association ("NMSA"), at 4-5 (grandfathering rules should cover addition of new stations to a route if grandfathering is required by adoption of new channel plans).

supports Alcatel's proposal that the 3.6-3.7 GHz band should be made available for shared use by fixed common carrier and private microwave users on a co-primary basis and shared with government users.[19] The TIA strongly urges the Commission to expedite its discussions with the National Information and Telecommunications Administration regarding the shared use of this band. Although the need for additional fixed microwave capacity is a long-term concern, the TIA believes that the Commission should act now to complete the discussions regarding the 3.6-3.7 GHz band to provide much needed certainty for microwave spectrum users and equipment manufacturers.

CONCLUSION

As the principal representative organization for the fixed microwave equipment manufacturing industry, the TIA is acutely aware of the importance of the channelization plan and technical rules adopted in the proceeding for displaced 2 GHz users and incumbent users of the 4, 6, 10 and 11 GHz band. The rules adopted in this proceeding must fairly accommodate the needs of all displaced users, protect competition in the equipment manufacturing market, make efficient use of scarce spectrum, and avoid unnecessary increases in user costs. The TIA's 1.25 MHz-based channelization plan submitted with its initial Comments, modified to allow for 29.652 MHz spacing in the 6 GHz band best meets these objectives and should be adopted. Further, the public

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[19] Comments of Alcatel Network Systems, Inc., at 5-6. Alcatel states in its comments that "[b]ased on data regarding anticipated current and future capacity needs for 2 GHz microwave users, there may not be adequate capacity available in the higher bands to accommodate the displaced users." Id. at 6.

interest would be served if the Commission adopts the TIA's proposals concerning specific technical rules establishing prior coordination procedures and private microwave interference standards for the shared-use bands, and phased-in efficiency standards for digital microwave equipment. The TIA also urges the Commission to accelerate discussions with the NTIA to make government spectrum -- particularly in the 3.6-3.7 GHz band -- available to nongovernment displaced 2 GHz users. Together, the TIA's modified channelization plan and proposed technical rules, if adopted, would further the public interest in fostering new radio-based technologies while accommodating important existing spectrum uses.

APPENDIX A

MODIFIED PROPOSED RECHANNELIZATION PLAN

5,925 - 6,425 MHz, 1.2355 Mhz bandwidth channels 1

	Transmit (receive) (MHz)	Receive (transmit) (MHz)
1	5925.6250	6175.6250
2	5926.8750	6176.8750
3	5928.1250	6178.1250
4	5929.3750	6179.3750
5	6108.90175	6360.94175
6	6110.13725	6362.17725
7	6111.37275	6363.41275
8	6112.60825	6364.64825
9	6113.84375	6365.88375
10	6115.07925	6367.11925
11	6116.31475	6368.35475
12	6117.55025	6369.59025
13	6118.78575	6370.82575
14	6120.02125	6372.06125
15	6121.25675	6373.29675
16	6122.49225	6374.53225
17	6123.72775	6375.76775
18	6124.96325	6377.00325
19	6126.19875	6378.23875
20	6127.43425	6379.47425
21	6128.66975	6380.70975
22	6129.90525	6381.94525
23	6131.14075	6383.18075
24	6132.37625	6384.41625
25	6133.61175	6385.65175
26	6134.84725	6386.88725
27	6136.08275	6388.12275
28	6137.31825	6389.35825

5,925 - 6,425 MHz, 1.2355 Mhz bandwidth channels 1

	Transmit (receive) (MHz)	Receive (transmit) (MHz)
29	6138.55375	6390.59375
30	6139.78925	6391.82925
31	6141.02475	6393.06475
32	6142.26025	6394.30025
33	6143.49575	6395.53575
34	6144.73125	6396.77125
35	6145.96675	6398.00675
36	6147.20225	6399.24225
37	6148.43775	6400.47775
38	6149.67325	6401.71325
39	6150.90875	6402.94875
40	6152.14425	6404.18425
41	6153.37975	6405.41975
42	6154.61525	6406.65525
43	6155.85075	6407.89075
44	6157.08625	6409.12625
45	6158.32175	6410.36175
46	6159.55725	6411.59725
47	6160.79275	6412.83275
48	6162.02825	6414.06825
49	6163.26375	6415.30375
50	6164.49925	6416.53925
51	6165.73475	6417.77475
52	6166.97025	6419.01025
53	6170.6250	6420.6250
54	6171.8750	6421.8750
55	6173.1250	6423.1250
56	6174.3750	6424.3750

1 Alternate channels. These channels should be used only if all other channels at 6,525 - 6,875 MHz are blocked.

5,925 - 6,425 MHz, 2.471 MHz bandwidth channels 1

	Transmit (receive) (MHz)	Receive (transmit) (MHz)
1	5926.2500	6176.2500
2	5928.7500	6178.7500
3	6109.5195	6361.5595
4	6111.9905	6364.0305
5	6114.4615	6366.5015
6	6116.9325	6368.9725
7	6119.4035	6371.4435
8	6121.8745	6373.9145
9	6124.3455	6376.3855
10	6126.8165	6378.8565
11	6129.2875	6381.3275
12	6131.7585	6383.7985
13	6134.2295	6386.2695
14	6136.7005	6388.7405
15	6139.1715	6391.2115
16	6141.6425	6393.6825
17	6144.1135	6396.1535
18	6146.5845	6398.6245
19	6149.0555	6401.0955
20	6151.5265	6403.5665
21	6153.9975	6406.0375
22	6156.4685	6408.5085
23	6158.9395	6410.9795
24	6161.4105	6413.4505
25	6163.8815	6415.9215
26	6166.3525	6418.3925
27	6171.2500	6421.2500
28	6173.7500	6423.7500

1 Alternate channels. These channels should be used only if all other channels at 6,525 - 6,875 MHz are blocked.

5,925 - 6,425 MHz, 3.7065 MHz bandwidth channels 1

	Transmit (receive) (MHz)	Receive (transmit) (MHz)
1	6110.13725	6362.17725
2	6113.84375	6365.88375
3	6117.55025	6369.59025
4	6121.25675	6373.29675
5	6124.96325	6377.00325
6	6128.66975	6380.70975
7	6132.37625	6384.41625
8	6136.08275	6388.12275
9	6139.78925	6391.82925
10	6143.49575	6395.53575
11	6147.20225	6399.24225
12	6150.90875	6402.94875
13	6154.61525	6406.65525
14	6158.32175	6410.36175
15	6162.02825	6414.06825
16	6165.73475	6417.77475

1 Alternate channels. These channels should be used only if all other channels at 6,525 - 6,875 MHz are blocked.

5,925 - 6,425 MHz, 4.942 MHz bandwidth channels 1

	Transmit (receive) (MHz)	Receive (transmit) (MHz)
1	6110.755	6362.795
2	6115.697	6367.737
3	6120.639	6372.679
4	6125.581	6377.621
5	6130.523	6382.563
6	6135.465	6387.505
7	6140.407	6392.447
8	6145.349	6397.389
9	6150.291	6402.331
10	6155.233	6407.273
11	6160.175	6412.215
12	6165.117	6417.157

1 Alternate channels. These channels should be used only if all other channels at 6,525 - 6,875 MHz are blocked.